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AN APPROACH FOR EQUALIZING TEST SCORES FOR SKT-EXEMPT AFSCs

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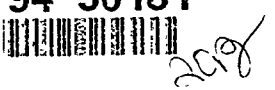

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The Weighted Airman Promotion Systems (WAPS) is used by the U.S. Air Force to promoted enlisted personnel to the grades of E-5 through E-7. WAPS is composed of six weighted factors: Specialty Knowledge Test (SKT), Promotion Fitness Exam (PFE), Enlisted Performance Reports (EPR), Time in Grade (TIG), Time in Service, and Decorations (DEC). Almost all Air Force Specialty Codes (AFSCs) use all six components of WAPS; however, a few AFSCs, like recruiters, do not have a SKT developed for them. This results in an increased weighting given to longevity factors. This paper examines the effects on promotion of SKT-exempt by doubling the weight given to the PFE. Sixteen SKT-exempt AFSCs and twenty-three non-exempt AFSCs were compared after doubling the PFE scores for exempted AFSCs. Chi-square analyses revealed a large change in those promoted and those who were not ($X2=2919$, $p < .0001$). Results indicate that if double-weighting is perceived to be fair and easy to understand by all enlisted personnel, a change in the system would result in the promotion of different personnel than is currently the case.

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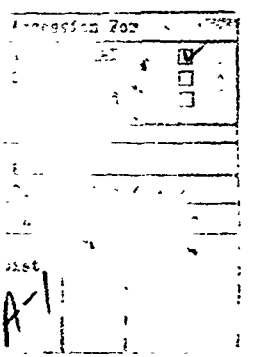

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PREFACE

This report documents an independent research project undertaken by HQ AFMPC/DPMYOT to examine the effects of eliminating the 100 points, attributable to the Specialty Knowledge Test (SKT), from the Weighted Airman Promotion System (WAPS) on the rank-ordering of members in SKT-exempt AFSCs. This project was reviewed by AL/HRM and was supported by the computer programming staff of AL/HR. A special thanks goes to Ms Doris Black and her staff for ensuring data availability and statistical analyses support.

AN APPROACH FOR EQUALIZING TEST SCORES FOR SKT-EXEMPT AFSCs

Introduction

Background

The Weighted Airman Promotion System (WAPS) is used by the US Air Force to promoted enlisted personnel to the grades of E-5 through E-7. WAPS is composed of six weighted factors which combine measures of professional knowledge, job performance, and experience (longevity): Specialty Knowledge Test (SKT), Promotion Fitness Exam (PFE), Enlisted Performance Reports (EPR), Time in Grade (TIG), Time in Service (TIS), and Decorations (DEC). Of a total of 460 possible points, the SKT and the PFE account for 100 points each; EPRs contribute 135 possible points; TIS, 40 points; TIG, 60 points; and DEC, 25 points. An airman's score on each factor is totaled and the sum of the total WAPS points is rank-ordered with all other members within each Air Force Specialty Code (AFSC) at each grade. The promotion percentage allocated by HQ Air Force for a specific grade is then used to select those who have the highest total WAPS points for promotion in that promotion cycle. While this approach may seem complicated, it is the most objective and open approach among the Services and has been accepted by enlisted personnel since its inception in 1970.

WAPS was developed in 1968 and fully implemented in 1970 to provide an enlisted promotion system that was objective and fair for all considered for promotion. As an alternative to what was then perceived as a biased and secretive approach to promotion, WAPS was a system fully under the control of each enlisted member. After implementation, WAPS has undergone revalidation in 1972, 1977, and 1986.

Using a policy-capturing approach for each revalidation, the data indicated that different promotion formulae should be applied to those in different grades (Treat, *et al*, 1987). However, it was determined that different weighting schemes would lead to a less understandable, and potentially less acceptable, system. The less empirical, and more policy driven, original weights have been used since WAPS development.

Almost all Air Force Speciality Codes (AFSCs) use all six components of WAPS. However, a few AFSCs such as recruiters and couriers, do not have a SKT developed for them. These special AFSCs take members from their primary AFSC to perform varied jobs in these diverse AFSCs, prohibiting the development of an AFSC-wide SKT. Other AFSCs have very small number of members making it not cost-effective to develop a SKT. Therefore, members in these SKT-exempt AFSCs must compete for promotion with a maximum of 360 point rather than the standard 460 points. This results in a disproportionate weighting given to the longevity factors, TIG and TIS (28% versus 22%). This statistical anomaly reduces the chances for promotion of those members more junior (less TIG and TIS) as compared to those members competing with both SKT and PFE. Even though all members of a SKT-exempt AFSC compete within that AFSC only, a perception of inequity with the rest of the enlisted force may exist, given the increased effects of longevity on the promotion score.

Purpose

This paper examines whether double-weighting the PFE portion of the WAPS formula, as well as other possible approaches, could reduce the effects of Time in Grade (TIG) and Time in Service (TIS) for SKT-exempt AFSCs. In their

revalidation of WAPS, Treat, *et al* (1987), examined the possibility of establishing "a separate weighting formula for AFSCs which have no SKT for any given year" (p. 4). In the policy capturing equations which resulted from raters' review of 100 records, the PFE had weights from three to eight times larger than when the SKT was included. They concluded the SKT-exempt AFSCs "should have a separate formula with a larger PFE weight" to compensate for the loss of the substantial variability contributed to the WAPS equation by the SKT.

Method

Subjects

WAPS component scores were taken from the records of 6643 E-4s competing for promotion to E-5, 7374 E-5s competing for promotion to E-6, and 5405 E-6s competing for promotion to E-7 in sixteen SKT-exempt AFSCs during FY 88 and FY 89. These AFSCs were randomly selected from each major occupational group (i.e., maintenance, electronics, operations, etc.). For comparison, the records of 65,285 E-4s, 54,308 E-5s, and 28,877 E-6s were examined. These members came from 23 randomly selected AFSCs across all major occupational groups which took both the SKT and the PFE. The data for the non-exempt AFSCs was taken from the same promotion cycles as the SKT-exempt AFSCs.

Instruments

The Promotion Fitness Examination (PFE) and the Specialty Knowledge Test (SKT) are norm-referenced instruments used to assess general professional knowledge and AFSC-specific (not job-specific) knowledge possessed by enlisted members

competing for promotion within each AFSC. Both tests are revised annually by senior enlisted subject-matter experts and personnel trained in test development. The PFE is taken by all enlisted personnel eligible for promotion to E-5 through E-7 while the SKT is taken only by those in AFSCs designated by the Air Force Military Personnel Center. Each instrument contains 100, 4-alternative multiple choice items. There are no parallel forms of these instruments. Typical means range from 45 to 65, with the majority ranging from 50 to 55. Items are selected based on statistical sufficiency, content validity, and referencibility to specific study materials published 6 months prior to the testing cycle. Reliability, as assessed by Chronbach's Alpha range from .85 to .98.

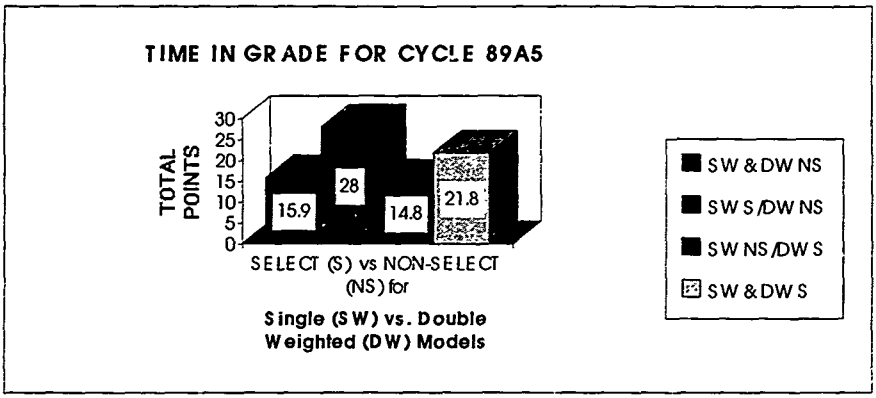
Analyses

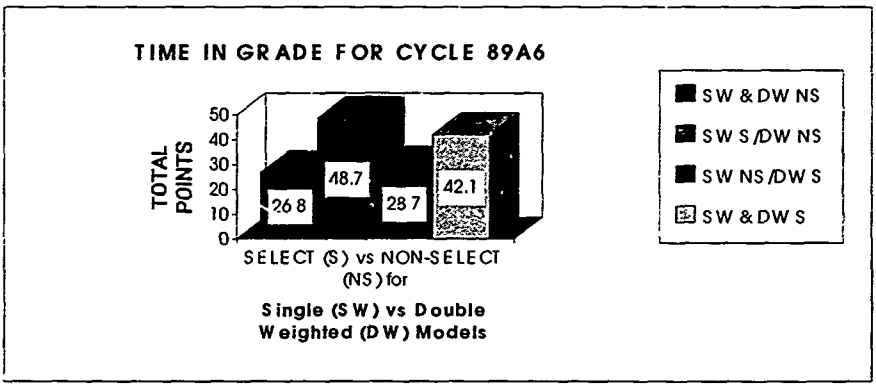
To determine the effects of double-weighting the PFE on promotion selections, the PFE scores of individuals in the 16 SKT-exempt AFSCs were doubled, added to their respective total WAPS scores, and then all members were rank-ordered based on their double weighted WAPS score. The same promotion percentage was then applied to the double weighted rank order. In order to determine equivalency of performance on the PFE between the 23 non-exempt AFSCs, means and standard deviations were computed and compared. A Pearson product moment correlation matrix for the combined 23 non-exempt AFSCs was calculated for all WAPS components. This analysis was performed for each grade considered and each promotion cycle (respective year of promotion testing). To examine whether members who were selected using the current promotion formula for SKT-exempt AFSCs were either selected or non selected when the PFE score was doubled, a Chi-square analysis was conducted for each grade. A Phi coefficient was also calculated for each Chi-square.

Results

The means and standard deviations within each grade between promotion cycles were compared and revealed some significant differences on WAPS components. For those E-5s (cycle 89A5) promoted under the current system (hereafter called single-weighted (SW)) and not under the experimental system (hereafter called double-weighted (DW)), their average Time in Grade (TIG) was 4 years, 8 months (TIG points are awarded as 1/2 point per month after pin-on of the current grade). However, those E-5s promoted after double-weighting only had 3 years 4 months TIG (see Figure 1). This pattern remained consistent for the other grades as well. Figure 2 shows the differences in Time in Service (TIS), revealing that TIS effects are not as prominent for more junior enlisted personnel (E-5s) as they are when seeking promotion to E-6 and E-7. It remains, however, that if more weight were placed on the knowledge portion of the WAPS formula, less senior personnel would be promoted. Enlisted Performance Reports (EPRs) contributes very little variability to the WAPS formula due to a strong ceiling effect. As grade increases, EPR scores are practically the same for members competing for higher rank. However, Figure 3 shows a small but definite difference between single-weighted and double-weighted groups, with the single-weighted group performing more poorly than those in the double-weighted group.

The Chi-square analyses, shown in Table 1, depict a significant change in those who would have been promoted if the PFE had been double-weighted. For those competing for promotion to E-5 (A5), 205 individuals would have been promoted by using a double-weighted PFE that were not promoted under the current promotion system. This 31 percent shift was highly significant ($\chi 2 = 2912$, $p < .0001$).





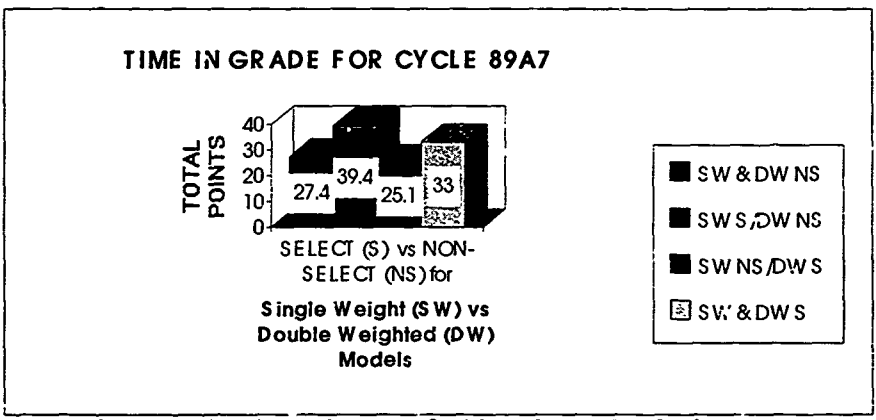


Figure 1. Time in Grade Means for Three Promotion Cycles.

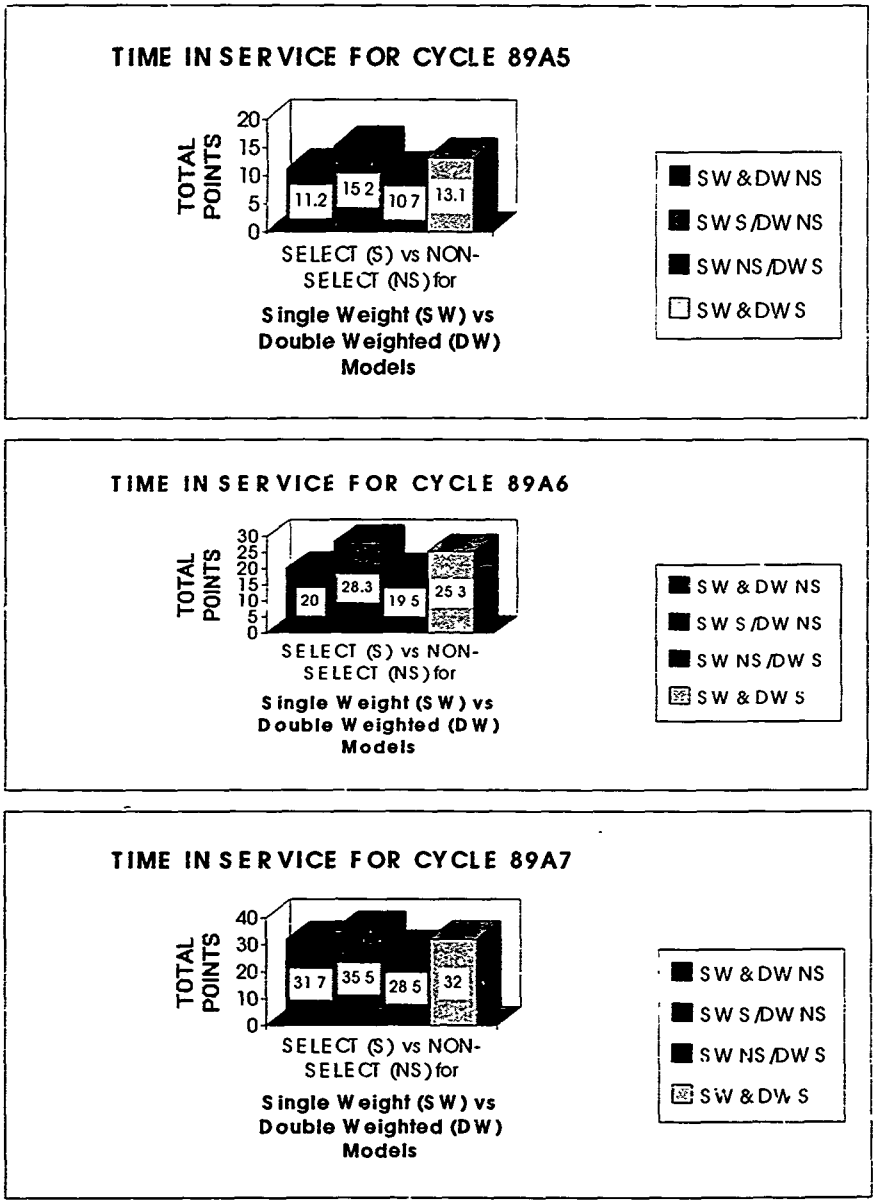


Figure 2. Time in Service Means for Three Promotion Cycles

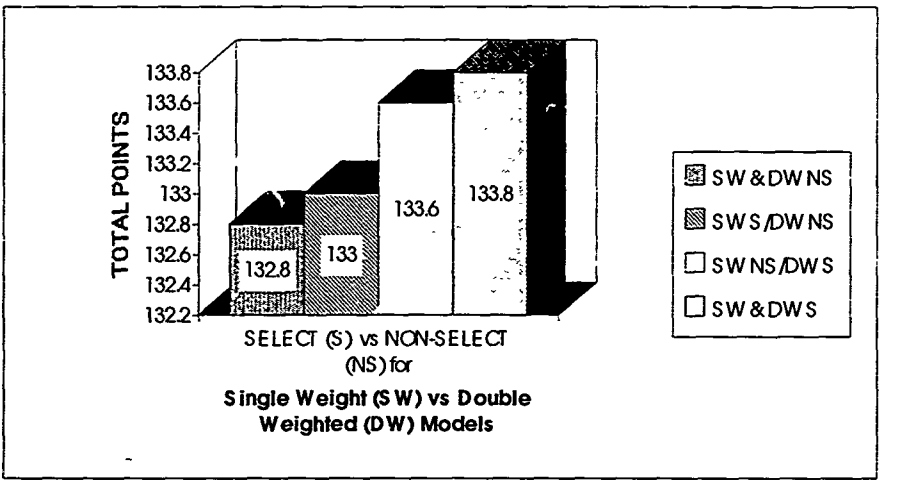


Figure 3. Enlisted Performance Report Means for Promotion Cycle 89A5

Table 1

CHI-SQUARE ANALYSIS OF DOUBLE-WEIGHTING EFFECTS

CYCLE 89A5

DOUBLE WEIGHT \ SINGLE WEIGHT	Non-select	Select
Non-select	5767	205
Select	205	466

CYCLE 89A6

DOUBLE WEIGHT \ SINGLE WEIGHT	Non-select	Select
Non-select	6247	249
Select	249	629

CYCLE 89A7

DOUBLE WEIGHT \ SINGLE WEIGHT	Non-select	Select
Non-select	2550	171
Select	171	513

For those competing for promotion to E-6 (A6), the 28 percent shift from single-weighted to double-weighted was also significant ($\chi 2 = 3391$, $p < .0001$). For those competing for promotion to E-7 (A7), the shift of 171 personnel, while less dramatic, was sill significant ($\chi 2 = 376$, $p < .0001$). This reduced effect may be the result of more homogeneity among competing personnel.

Table 2 shows the intercorrelations among all WAPS components for those competing for promotion to E-5 in the 23 non-exempt AFSCs. The strong correlation between SKT and PFE ($r = .42$, $p < .001$) demonstrates the interrelationship of two measures of Air Force and specialty knowledge. The relationship between TIG and TIS ($r = .886$, $p < .001$) is also logical, since both are measures of longevity. The moderate relationship between decorations and TIG and TIS is strongest with personnel competing for promotion to E-5 ($r = .23$ and $r = .22$, $p < .001$, respectively) as compared to E-6 and E-7 promotion cycles.

Table 2

AVERAGE CORRELATIONS AMONG WAPS FACTORS
FOR CYCLES 89A5 AND 90A5 IN 23 NON-EXEMPT AFSCs

	SKT	PFE	TIG	TIS	EPR	DEC
SKT						
PFE	.42					
TIG	.06	.04				
TIS	.04	-.05	.89			
EPR	.09	.12	-.12	-.18		
DEC	.06	.08	.23	.22	.18	

NOTE: All correlations significant at p < .01

Table 3 contains correlations among WAPS components for those competing for promotion to E-6 in the non-exempt AFSCs. The relationship between SKT and PFE is stronger in this group than for the E-5 group ($r = .55$, $p < .001$). The same strong relationship exists between TIG and TIS. However, it appears that the

Table 3

AVERAGE CORRELATIONS AMONG WAPS FACTORS
FOR CYCLES 89A6 AND 90A6 IN 23 NON-EXEMPT AFSCs

	SKT	PFE	TIG	TIS	EPR	DEC
SKT						
PFE	.55					
TIG	-.08	.07				
TIS	-.27	-.26	.82			
EPR	.14	.14	-.19	-.30		
DEC	.04	.04	.16	.14	.23	

NOTE: All correlations significant at p < .01

longer an individual is in the Air Force (TIS), the less well that individual will do on the SKT and PFE (r= -.27 and r= -.26, p< .001, respectively). Also, the effect of TIG and TIS on decoration points has moderated, probably due to a restriction in range effect.

Table 4
AVERAGE CORRELATIONS AMONG WAPS FACTORS
FOR CYCLES 89A7 AND 90A7 IN 23 NON-EXEMPT AFSCs

	SKT	PFE	TIG	TIS	EPR	DEC
SKT						
PFE	.53					
TIG	-.16	-.17				
TIS	-.44	-.45	.71			
EPR	.12	.14	-.18	-.30		
DEC	.02	.03	.04	-.03	.26	

NOTE: All correlations significant at p <: .01

Table 4 illustrates the correlations among WAPS components for those competing for promotion to E-7 in the non-exempt AFSCs. Again a strong relationship exists the SKT and the PFE (r= .53, p< .001). Also, the correlation between the SKT and PFE with TIS is even stronger in the negative direction (r= -.44 and r= -.45, p< .001, respectively). TIG and TIS are still strongly related, but less so than for the E-5 and E-6 groups (r= .71, p< .001). The relationship between TIG and TIS with decorations has all but disappeared probably due to the fact that as senior NCOs, most have nearly the same decoration points.

Discussion

The data show two different and interesting profiles for those promoted under the single-weighted and double-weighted systems. By double-weighting the PFE, a quite different group of personnel were selected for promotion. Those selected under the double weighted system were more junior in grade and performed significantly better on the PFE than did the single-weighted group. Since EPRs have little variability, the points awarded for performance did not play a significant role in separating the two groups.

When looking at the correlations among the WAPS components, some expected and some not so expected results are revealed. Those more senior in SKT-exempt AFSCs seem to be more effected by the increased reliance on TIG and TIS. Typically, those that perform well on the PFE but are more junior have less of a chance at being promoted. The issue is what type of individual does the system want or need to promote. The choices are those that test well and perform well or those that don't test as well, perform adequately, and have more seniority.

There are two approaches to altering the WAPS system to eliminate the differences in promotion formulae for SKT-exempt and non-exempt AFSCs. Doubling the PFE score is a simple linear change that can be easily explained and understood by the enlisted force. However, there are potential problems with this approach. It assumes that the PFE is statistically equivalent to the SKT which, based on correlational data, it is not. The SKT measures something different than the PFE (only 16 percent shared variance), thereby creating a possible content validity issue. It is, however, the easiest adaptation to the current system.

The second, more statistically pure, approach is to obtain the correlation by grade between the SKT and PFE for the non-exempt AFSCs and create an adjusted estimate of the SKT for the exempt AFSCs. The formula needed to make this estimate is shown below:

$$\text{Double-weighted SKT} = (\rho * (\sigma_Y / \sigma_X)) * (X - \overline{X}) + \overline{Y}$$

The major problem with this solution is that it appears to the enlisted force as some magical numbers manipulation and cannot be directly related to the original formula. A difficult and timely education program would need to be provided to gain enlisted acceptance of the double-weighted formula, a central focus of the current system. Further work is expected in this area to ensure a fair and equitable promotion system for all Air Force enlisted personnel.

References

Treat, B. L., Gott, C.D., and Albert, W.G. (1987, August). *Weighted Airman Promotion System (WAPS) Re-evaluation: 1986.* (AFHRL -SR- 86-66), Brooks AFB TX.

SUMMARY

The results of this study indicate that double-weighting the Promotion Fitness Examination (PFE) portion of the WAPS formula for SKT-exempt AFSCs has a significant effect on those selected for promotion. By using the double-weighted PFE score for SKT-exempt AFSCs, the effects of longevity are made relatively equivalent to those AFSCs using both SKT and PFE in the WAPS formula. This approach seems easier to understand by the enlisted force than applying a statistical adjustment.

This approach is being briefed and staffed at HQ AFMPC for eventual disposition. Whatever the results of the review may be, the purpose of this investigation was to provide the WAPS with an easily explainable and wholly defensible adjustment to total WAPS points for SKT-exempt AFSCs.